

STRUCTURE OF MICROCARD

The user prompting appears on every page, e.g.:

- Continue: B17/1
- Continue: B18/1 Fig.: B17/2

.../1 = Upper coordinate half

.../2 = Lower coordinate half

Continue: A03/1

SPECIAL FEATURES .

These instructions describe repair and testing of series PE(S)..P.. in-line pumps with start-of-delivery blocking flange (IDB) and governors RQV..PA.. with cutoff block (DT:).

Note:

These instructions deal exclusively with operations which d i f f e r f r o m the product-related basic instructions.

Continue: A03/2

SPECIAL FEATURES

In addition to these instructions, the following instructions are also required for repair and testing of series PE(S)..P.. in-line pumps with start-of-delivery blocking flange (IDB) and governors RQV..PA.. with cutoff block(DTP):

- * Repair instructions for pump PE(S)..P..
- * Repair instructions for governor RQ/RQV..
- * Test instructions for pump PE(S)..P..
- * Test instructions for governor RQ/RQV..

Refer to microcard W-400/00..

Continue: A04/1

SPECIAL FEATURES

- CUTOFF BLOCK (DTP)

The cutoff block DTP blocks the control lever in the cutoff position and thus prevents inadvertent start-up of the engine.

The cutoff block DTP is likewise designed to prevent unintentional engine stop.

There are two different types of cutoff block DTP.

The adjustment procedures for both versions are described in these instructions.

Continue: A05/1

GENERAL INSTRUCTIONS

Misceleaneous:

Always renew sealing elements.

If injection-pump components are to be stored for a lengthy period, they should be covered and protected against rusting.

Wash out plunger-and-barrel assemblies and delivery-valve assemblies in cleaning agent; Moisten plungers with calibrating oil.

Rub over sealing rings with tallow.

Continue: A06/1

SAFETY MEASURES

Cleaning of components:

Wash out components in cleaning agent such as chlorothene NU, which is both commercially available and not readily flammable.

Pay attention to the following safety regulations !!!

In Germany:

Order Governing Work with Combustible Liquids (Vbf) as published by Federal Labor Ministry (BmA).

Continue: A06/2

SAFETY MEASURES

Safety regulations for handling chlorinated hydrocarbons

Companies ZH 1 / 222

Employees ZH 1 / 119

as published by the Hauptverband für Gewerbliche Berufsgenossenschaften (Zentralverband für Unfallschutz und Arbeitsmedizin), Langwartweg 103, 5300 Bonn 5, Germany.

As regards other countries, attention is to be paid to the appropriate local legislation.

Continue: A07/1

SAFETY MEASURES

EXCLUSIVE use is to be made of the special tools listed in these repair instructions.

INJURIES CANNOT BE RULED OUT if these tools are not used !

Continue: A08/1

TESTERS, DEVICES AND TOOLS

Coupling 9 689 085 041

* Adjustment of pre-stroke

Holding key KDEP 1555

* Counter-holding and turning
of camshaft

Puller screw 9 689 086 014

* Pulling off of taper flange

Puller KDEP 2911 and 2911/3

* Pulling off of barrel-and-valve
assemblies

Adaptor 9 689 085 042

* Measurement of torque of
control-lever shaft

Continue: A08/2

TESTERS, DEVICES AND TOOLS

Striker bar 9 689 087 005

* Measurement of axial clearance
of camshaft

Plug 9 689 085 034

* Sealing of fuel inlet

Fitting 9 401 083 168

* Connection - fuel inlet

Fitting 9 689 085 036

* Connection for overflow valve
and plug

Continue: A09/1

TESTERS, DEVICES AND TOOLS

Plug 9 689 085 035

- * Seal for suction-gallery opening
(opposite overflow valve)

Locking device 9 689 085 037

- * Assembly of taper flange

Locking bolt 9 689 085 038

- * Adjustment of pre-stroke, assembly
of taper flange and installation of
pump in engine

Plug 9 911 271 701

- * Seal for overflow valve opening

Continue: A09/2

TESTERS, DEVICES AND TOOLS

Drive coupling 9 689 085 040

- for pump on indirect injection engine

Drive coupling 9 689 085 087

- for pump on direct injection engine

- * Adjustment of governor

Puller and puller 9 689 080 017

wedge 9 689 086 015

- * Removal of coupling

Measuring device KDEP 2890

Taper 17 mm

- * Adjustment of axial clearance of
camshaft

Continue: A10/1

TESTERS, DEVICES AND TOOLS

Measuring device 1 688 130 130
with accessory set 1 687 000 053
* Measurement of control-rod travel

Measuring device 1 688 130 085
* Measurement of start of delivery

Assembly device 9 689 085 039
* Assembly of taper flange

Special grease 5 932 240 150
* Lubrication of cutoff block (DTP)

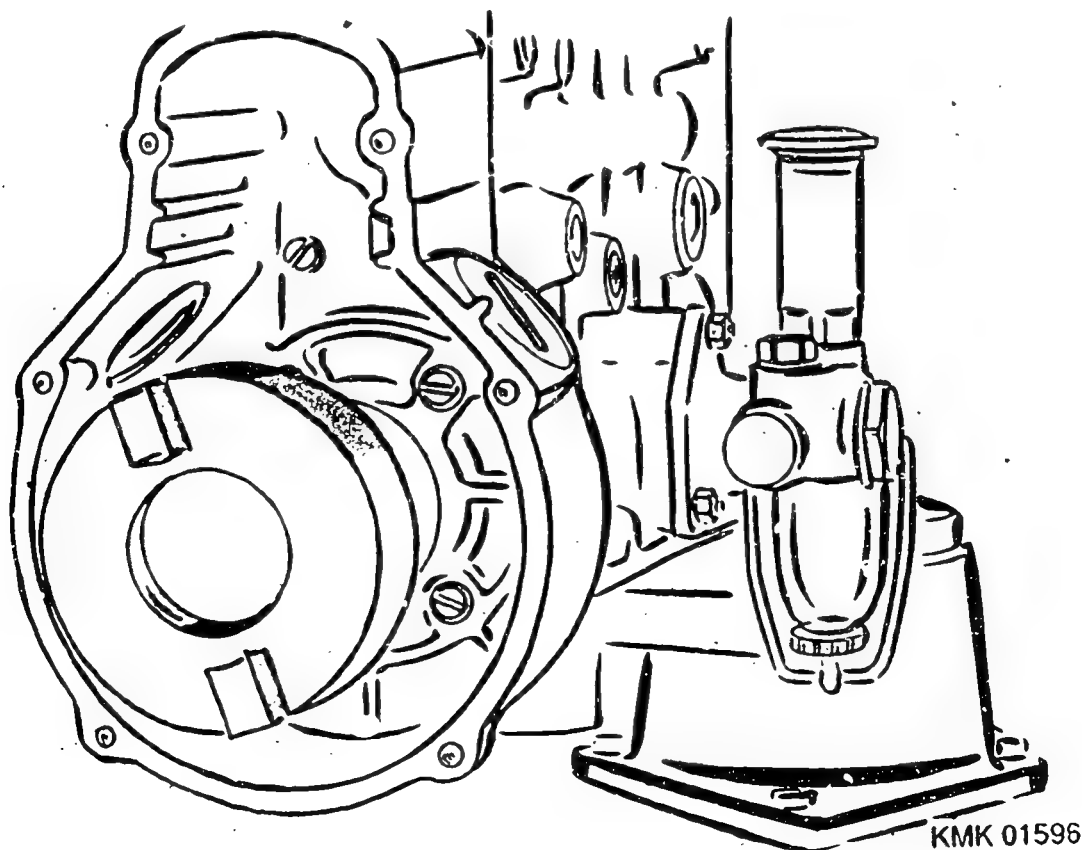
Protractor 1 688 130 183
* Determination of control-lever
position

Continue: B01/1

DISASSEMBLY OF EXTERNALLY MOUNTED GOVERNOR/PUMP PARTS

Following disassembly of flyweight
assembly, fit long coupling (17 mm
taper) 689 085 041 in position on
camshaft (governor end).

Continue: B02/1 Fig.: B01/2



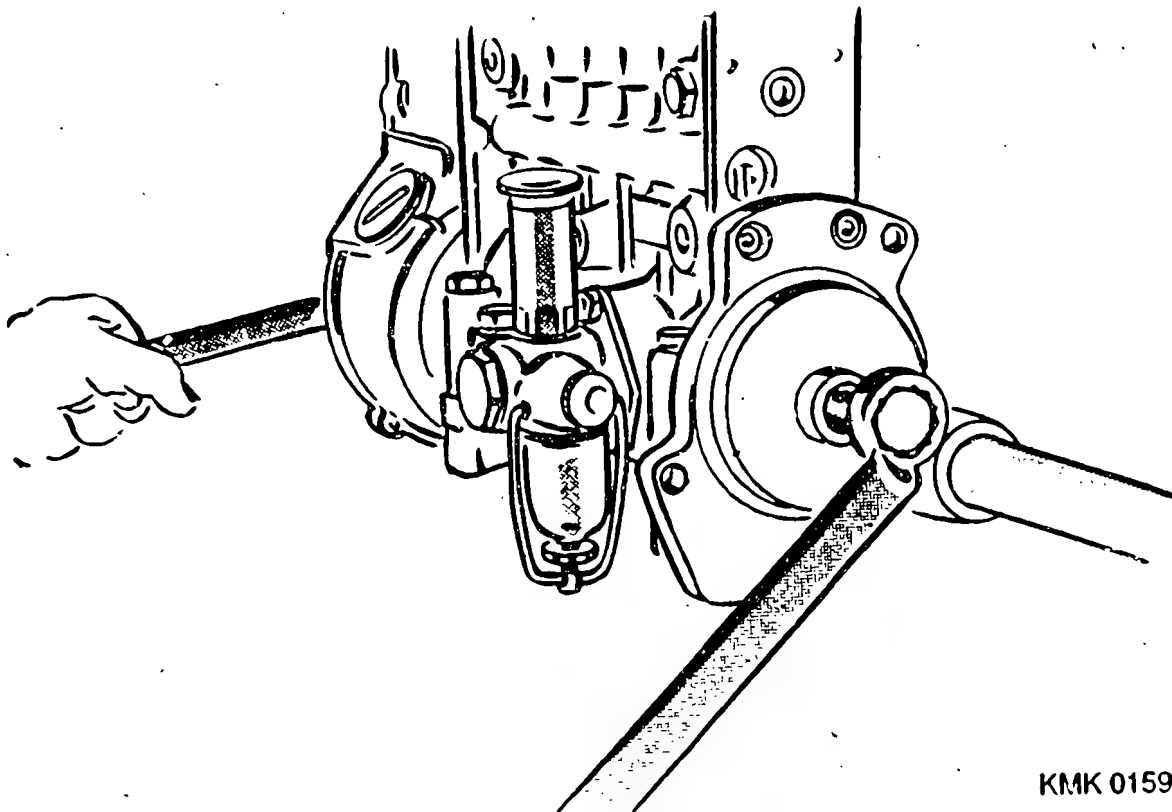
DISASSEMBLY OF EXTERNALLY MOUNTED GOVERNOR/PUMP PARTS

Counter-hold camshaft with holding key
KDEP 1555 and remove drive-taper flange
with puller screw 9 689 086 014.

Note:

Taper flange position does not have to
be marked prior to disassembly.

Continue: B03/1 Fig.: B02/2

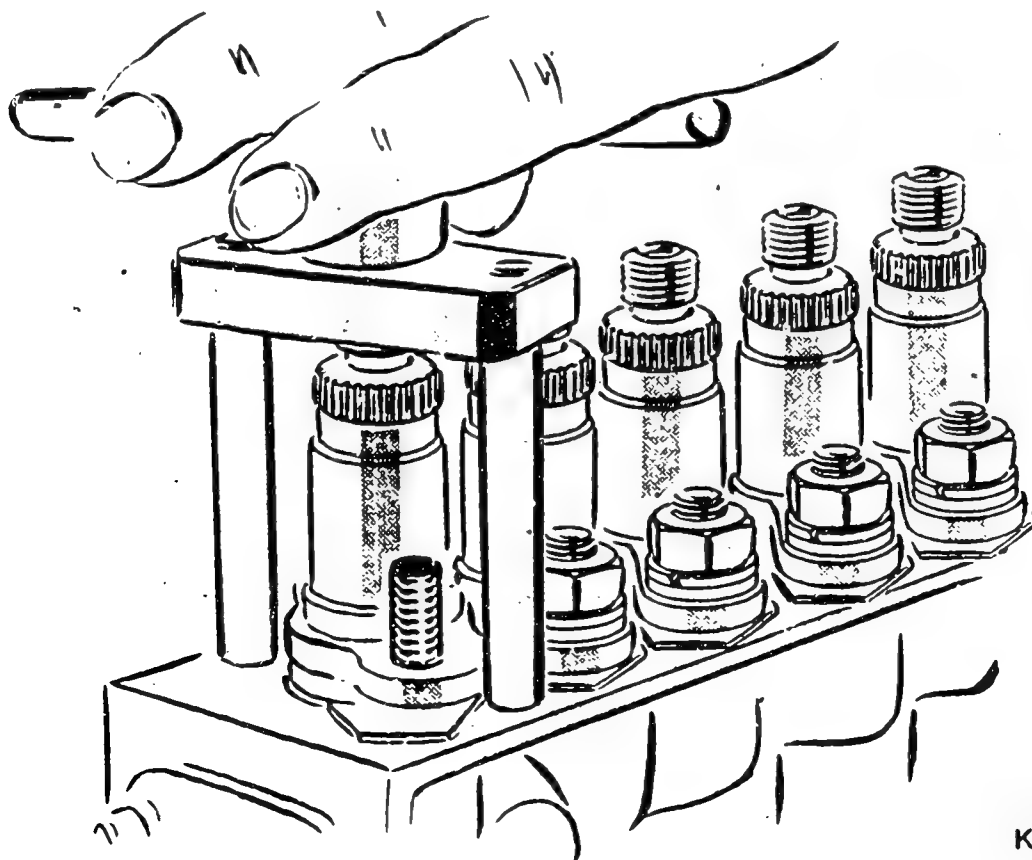


KMK 01597

DISASSEMBLY OF EXTERNALLY MOUNTED GOVERNOR/PUMP PARTS

Position spacer sleeves KDEP 2911/3 on
support pins of puller KDEP 2911.
Use puller to pull barrel-and-valve
assemblies out of pump housing.

Continue: B04/1 Fig.: B03/2



KMK 01598

CAMSHAFT - PUMP FLANGE ASSIGNMENT

Before installing camshaft in pump housing, measure distance between pump flange and end face of camshaft.

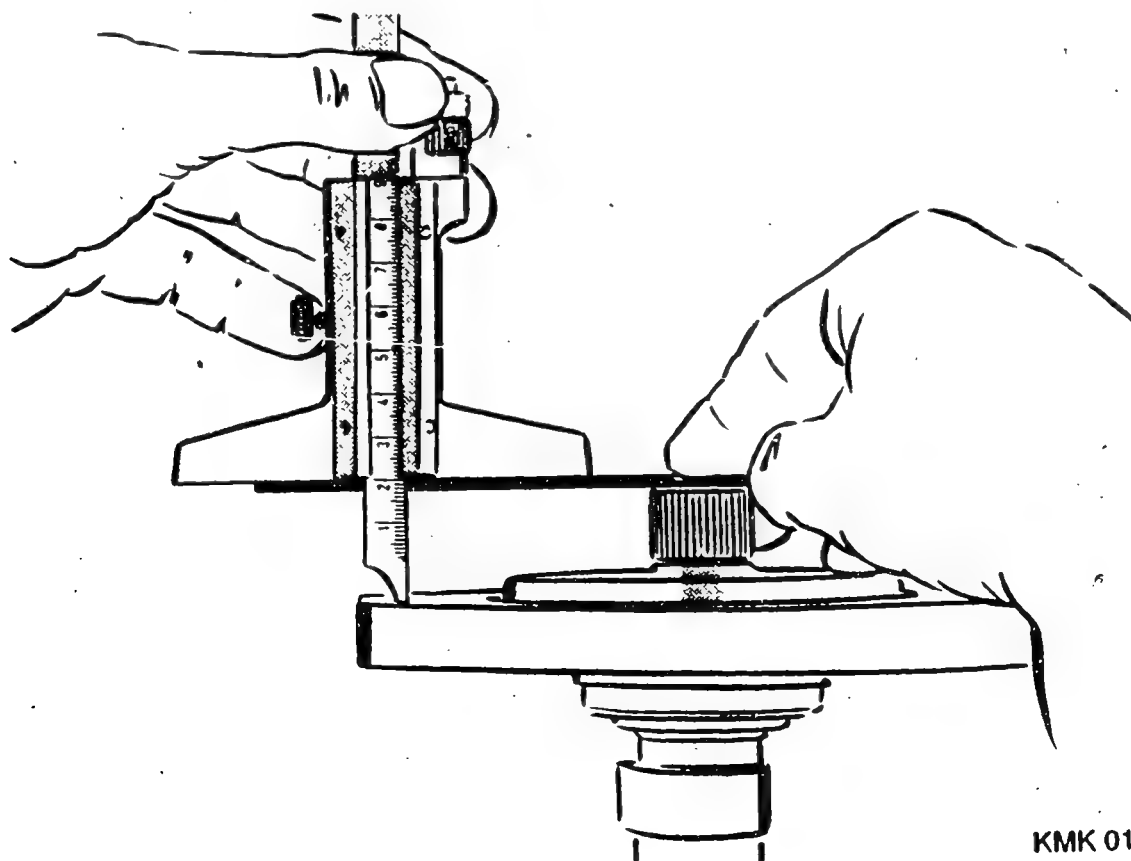
Spacing: 25.25...25.65 mm

If the spacing is outside the tolerance, perform adjustment with shims located beneath camshaft bearing.

Note:

Use is to be made for measurement purposes of a striker bar, the thickness of which is to be taken into account when determining the value.

Continue: B05/1 Fig.: B04/2



KMK 01599

CAMSHAFT PROJECTION

Insert camshaft without intermediate bearing into pump housing.

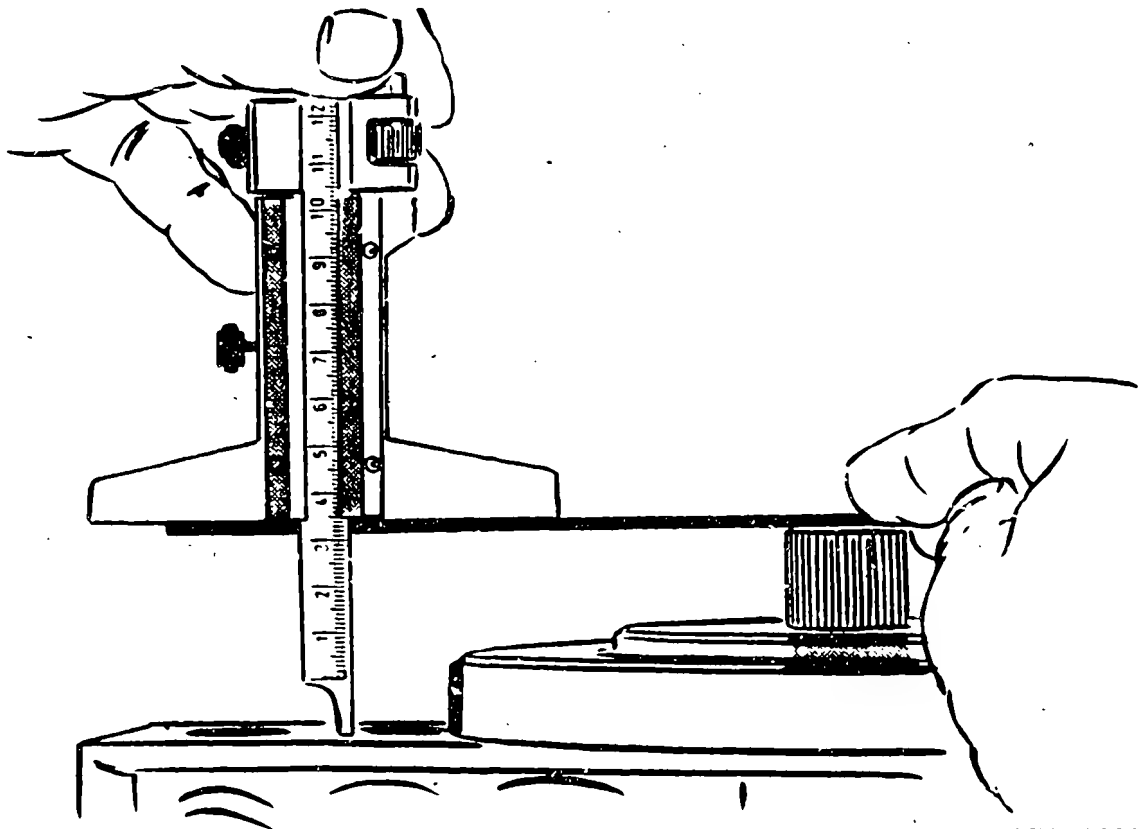
Fit and secure pump flange with shims found on removal, however without O-ring.

Measure distance between end face of camshaft and end face of pump housing.

Projection: 40.8...41.2 mm

If the projection is outside the tolerance range, effect correction by replacing shim at governor housing.

Continue: B06/1 Fig.: B05/2



KMK 01600

AXIAL CLEARANCE OF CAMSHAFT

Attach measuring device KDEP 2890 (17 mm taper) to camshaft on governor end. Attach dial indicator with 1 mm initial tension to measuring device and set to "0".

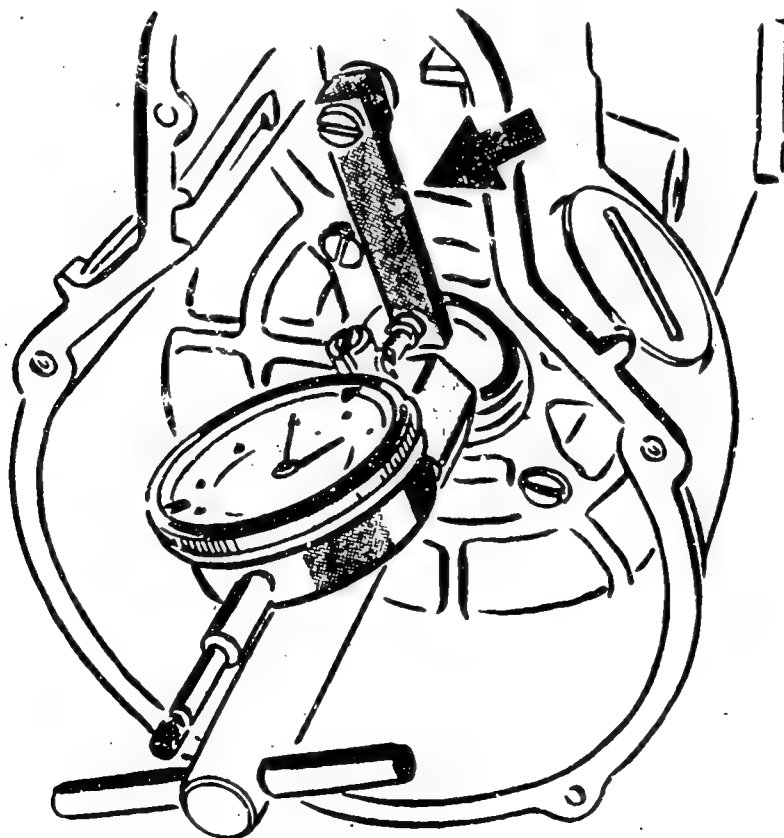
Base must now make contact with striker bar (arrow) 1 689 087 005 attached to governor housing.

Axial clearance: 0.02...0.06 mm

Following adjustment, remove camshaft and continue with assembly procedure in line with appropriate pump instructions.

Do not complete governor as yet.

Continue: B07/1 Fig.: B06/2



KMK 01601

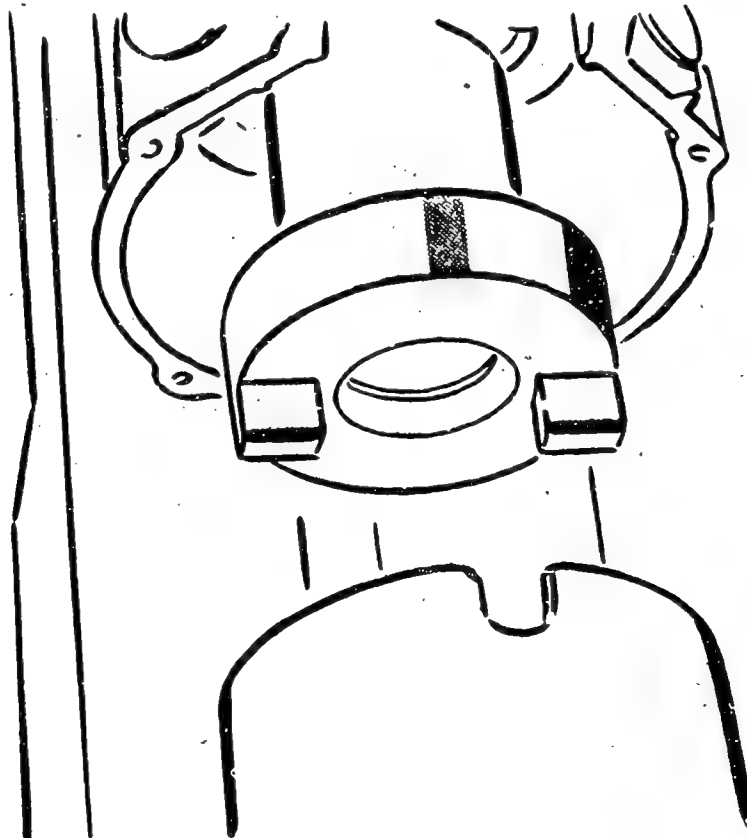
ASSEMBLY ON TEST BENCH

Fit coupling 9 689 085 041 on camshaft on governor end and assemble pump on test bench such that governor end with fitted coupling faces drive.

Important:

If the assembly is installed in a "direct injection engine", use is to be made of the keyway at the coupling "ID".

Continue: B08/1 Fig.: B07/2



KMK 01602

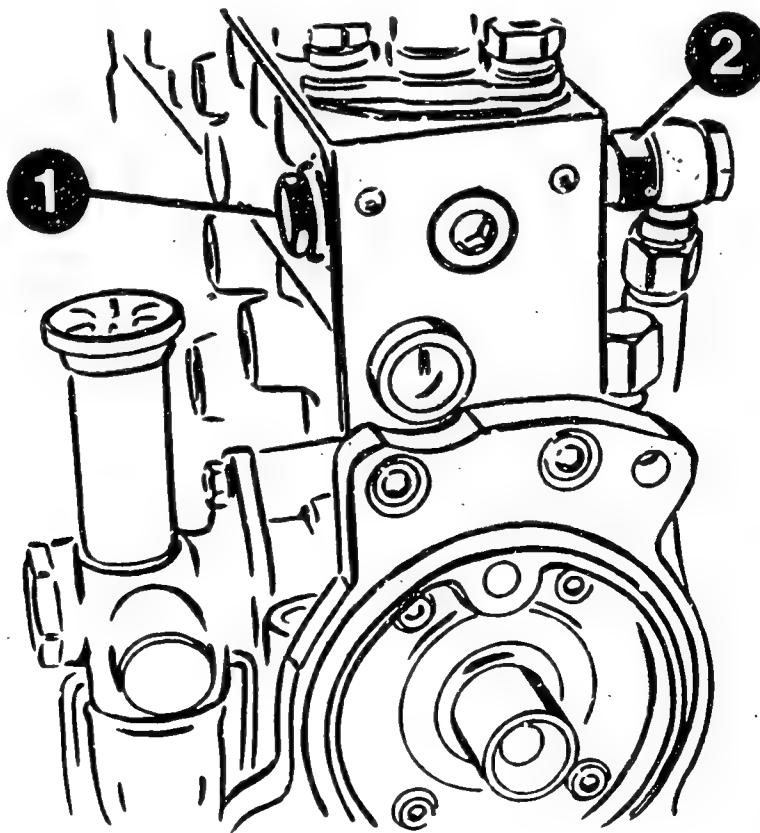
ASSEMBLY ON TEST BENCH

Seal fuel inlet with plug
9 689 085 034 (picture, 1).

Screw out plug on end face of pump.

Screw fitting 9 401 083 168 into pump
housing (picture, 2) and connect fuel
inlet to it.

Continue: B09/1 Fig.: B08/2



KMK 01603

ASSEMBLY ON TEST BENCH

Screw out overflow valve of pump and screw in fitting 9 689 085 036 in its place.

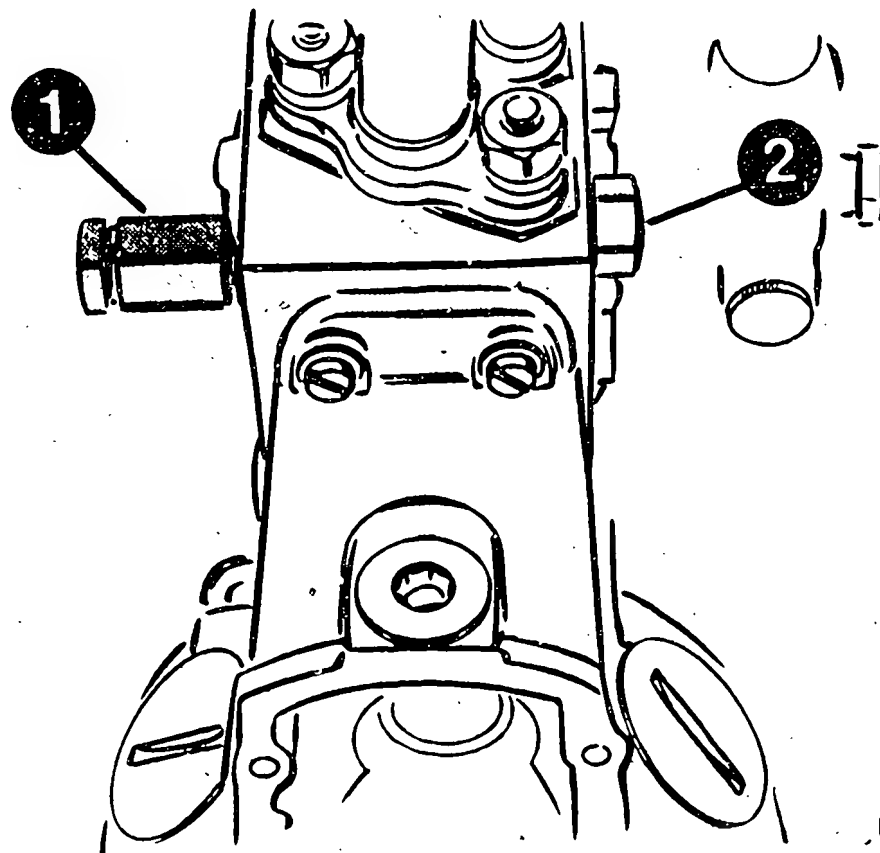
Seal fitting with plug 2 911 271 701 (picture, 1).

Seal opposite tapped hole in pump housing with plug 9 689 085 035 (picture, 2).

Note:

In the case of pumps with fitted ROBO diaphragm, replace diaphragm with plug for adjusting start of delivery.

Continue: B10/1 Fig.: B09/2



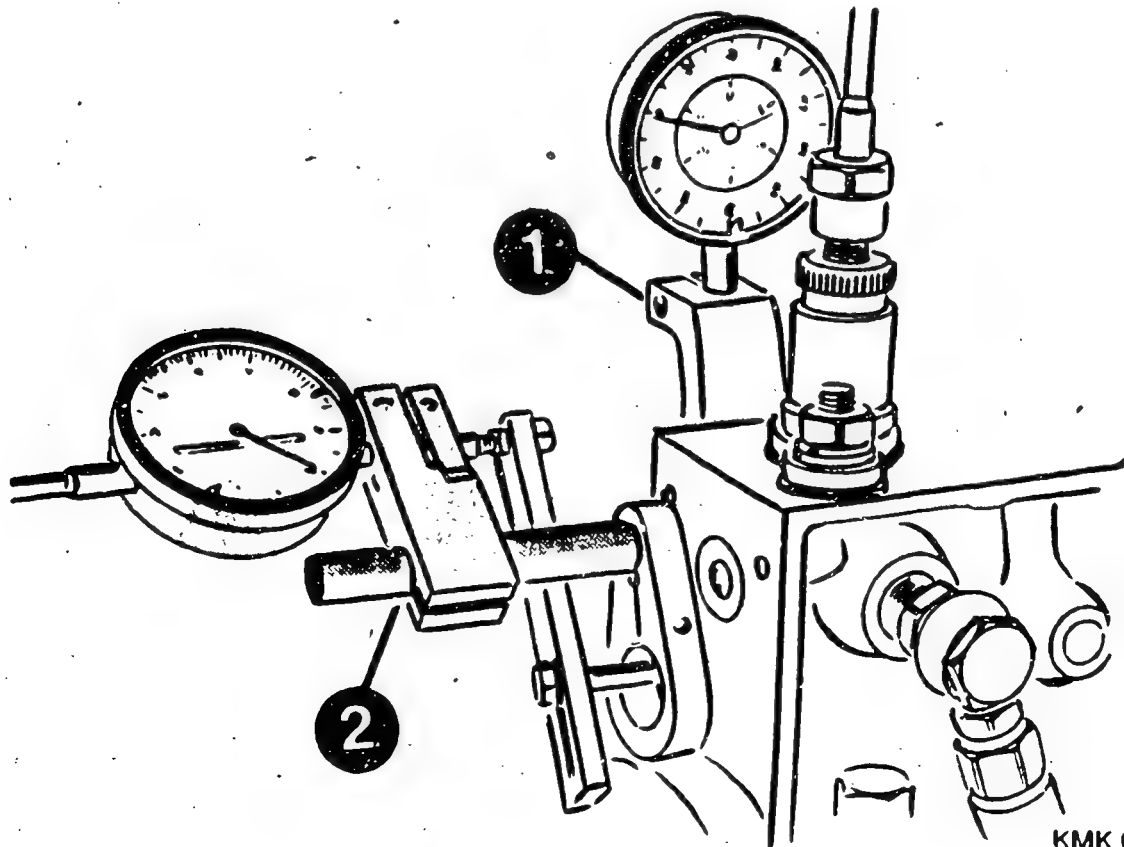
KMK 01604

ADJUSTMENT OF START OF DELIVERY

Attach control-rod-travel measuring device 1 688 130 130 (picture, 1) and start-of-delivery measuring device 1 687 233 012 (picture, 2) to pump.

Perform start-of-delivery adjustment in accordance with appropriate instructions and test-specification sheet.

Continue: B11/1 Fig.: B10/2



KMK 01605

ASSEMBLY OF TAPER FLANGE

Set scale at test-bench flywheel to
"ZERO DEGREES" on start of delivery at
cylinder no. 1.

Continue: B12/1

ASSEMBLY OF TAPER FLANGE

Turn test-bench flywheel in direction of rotation of pump from "ZERO DEGREES" position by number of degrees indicated in test-specification sheet under note:

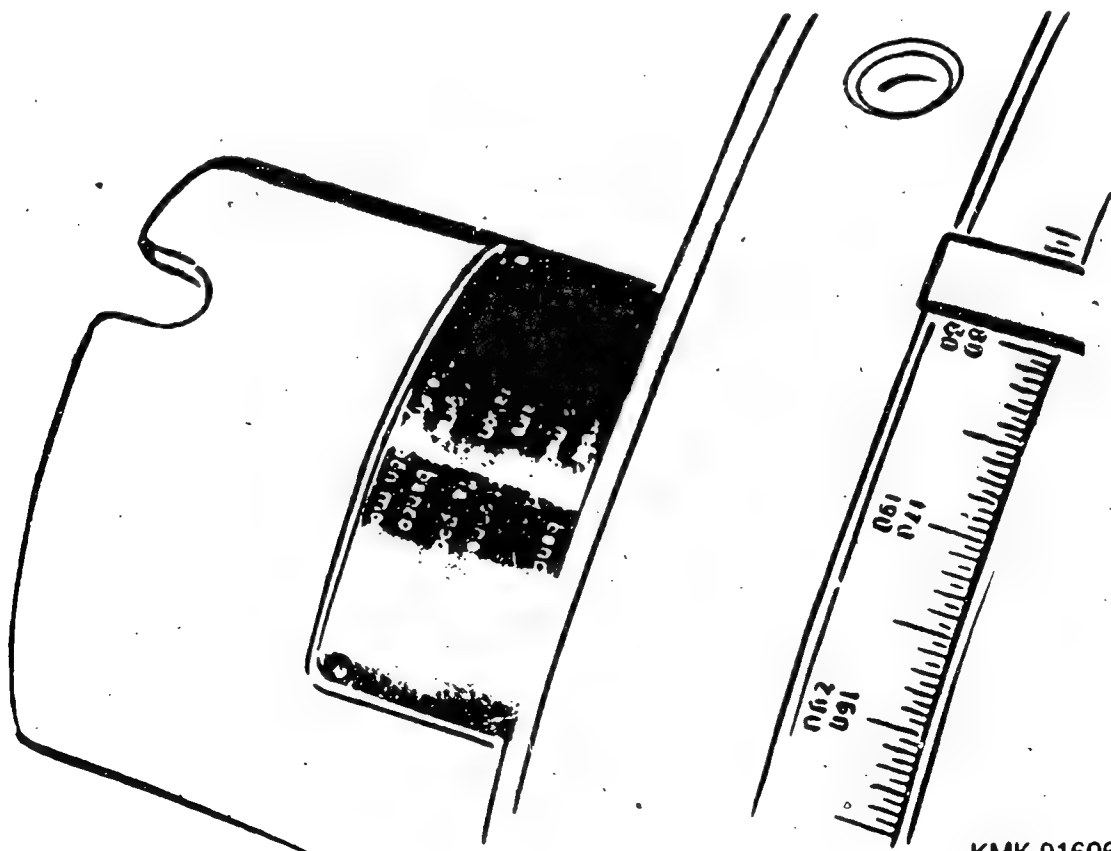
Start-of-delivery blocking at ... degrees following start of delivery of cylinder no. 1.

I m p o r t a n t:

Pay strict attention to direction of rotation.

Pump is wrong way round on test bench!

Continue: B13/1 Fig.: B12/2

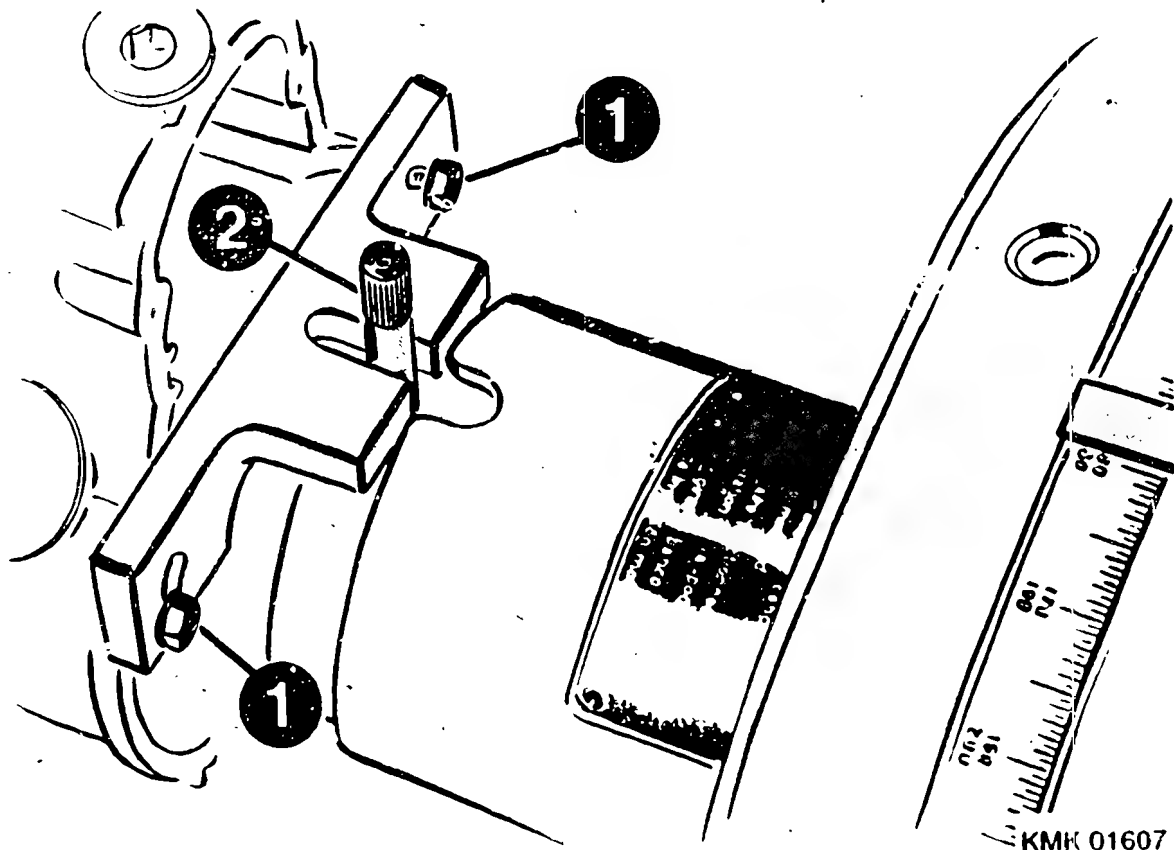


KMK 01606

ASSEMBLY OF TAPER FLANGE

Use the two fastening screws (picture, 1) to horizontally attach the locking device 9 689 085 037 to the governor housing; do not however tighten the screws. Insert locking bolt (picture, 2) 9 689 085 037 into coupling synchronization hole through groove in locking device (use is to be made in the case of direct injection of the hole marked "ID"). Ensure that the flywheel mark coincides with the value given in the test-specification sheet. Tightening fastening screws of locking device.

Continue: B14/1 Fig.: B13/2



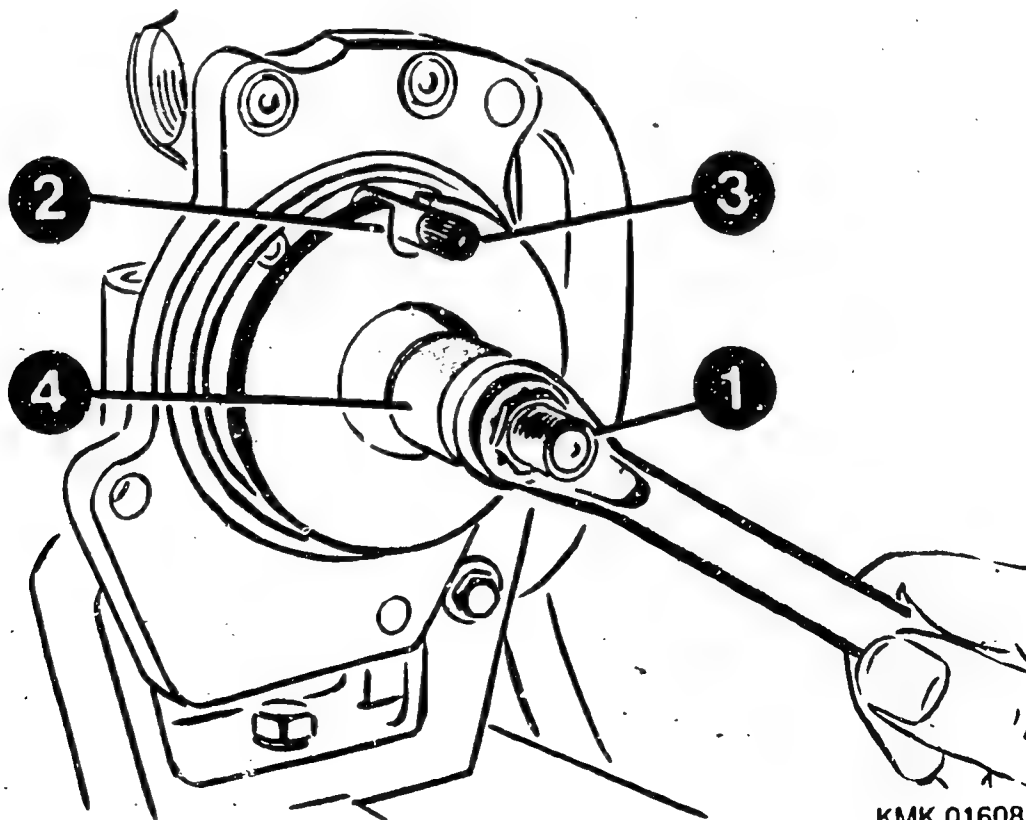
ASSEMBLY OF TAPER FLANGE

Use thread at seat taper to screw assembly device 9 689 085 039 into camshaft on drive end and secure (picture, 1).

Lubricate hole in taper flange. Push taper flange onto camshaft with groove for locking bolt (picture, 2) facing upwards.

Insert locking bolt (picture, 3) through groove in taper flange into hole in pump flange.

Continue: B15/1 Fig.: B14/2



KMK 01608

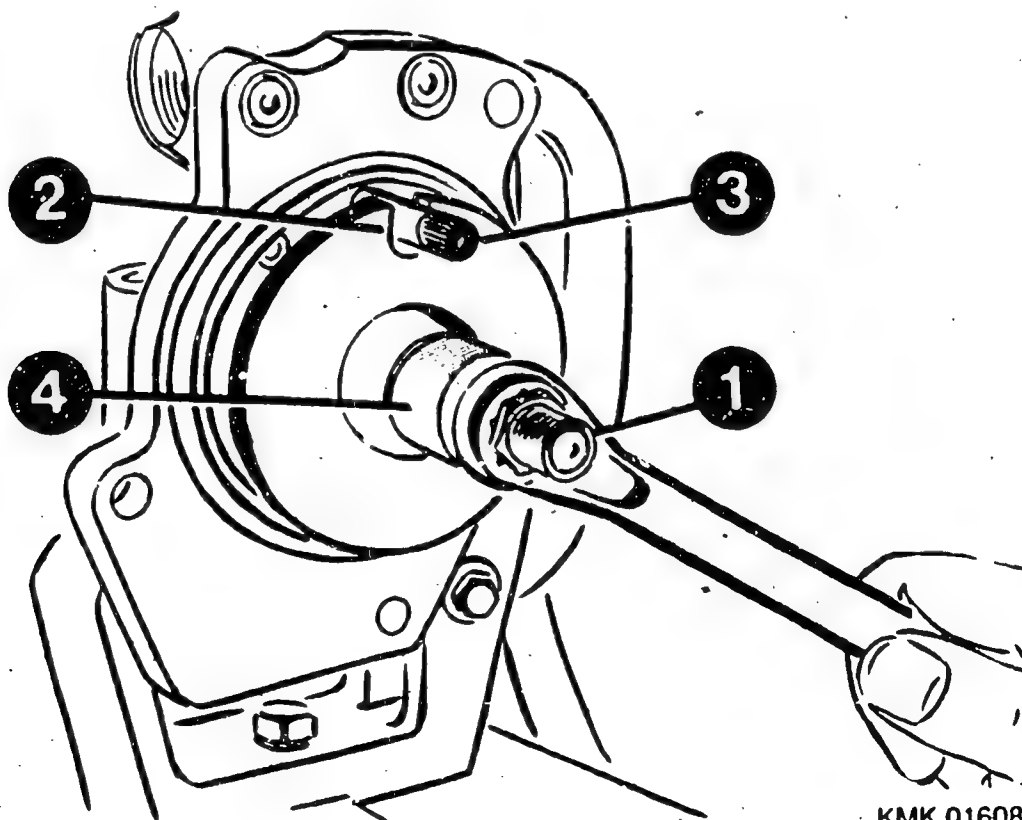
ASSEMBLY OF TAPER FLANGE

Attach guide bushing (picture, 4) to assembly device. Use assembly nut to move taper flange as far as stop. In this position, start-of-delivery blocking is guaranteed by the locking bolt and the taper flange. Remove both locking bolts and other tools.

Note:

When replacing injection-pump barrels, the taper flange is likewise to be replaced since it can only be used once on account of the material.

Continue: B16/1 Fig.: B15/2



KMK 01608

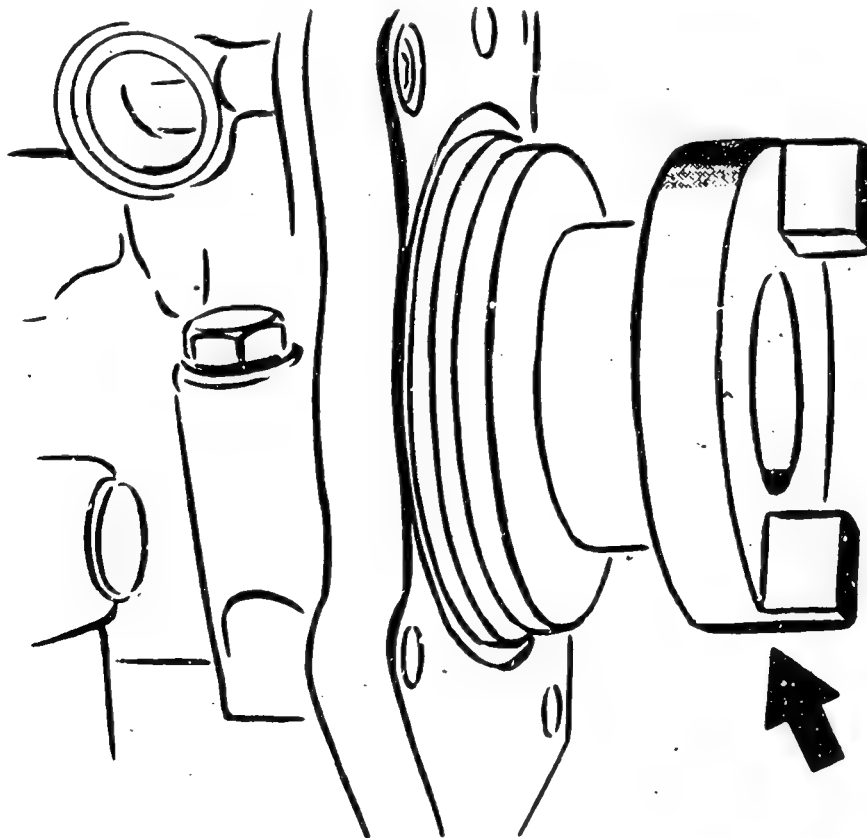
GOVERNOR ASSEMBLY

Remove pump from test bench and position it on clamping support. Use appropriate instructions to assemble governor with the exception of the governor cover.

Attach drive coupling 9 689 085 087 (for pump of direct injection engine) or drive coupling 9 689 085 040 (for pump of indirect injection engine) to camshaft on drive end using special washer and appropriate screw (arrow).

* Tightening torque: 143...157 Nm

Continue: B17/1 Fig.: B16/2



KMK 01609

GOVERNOR ASSEMBLY

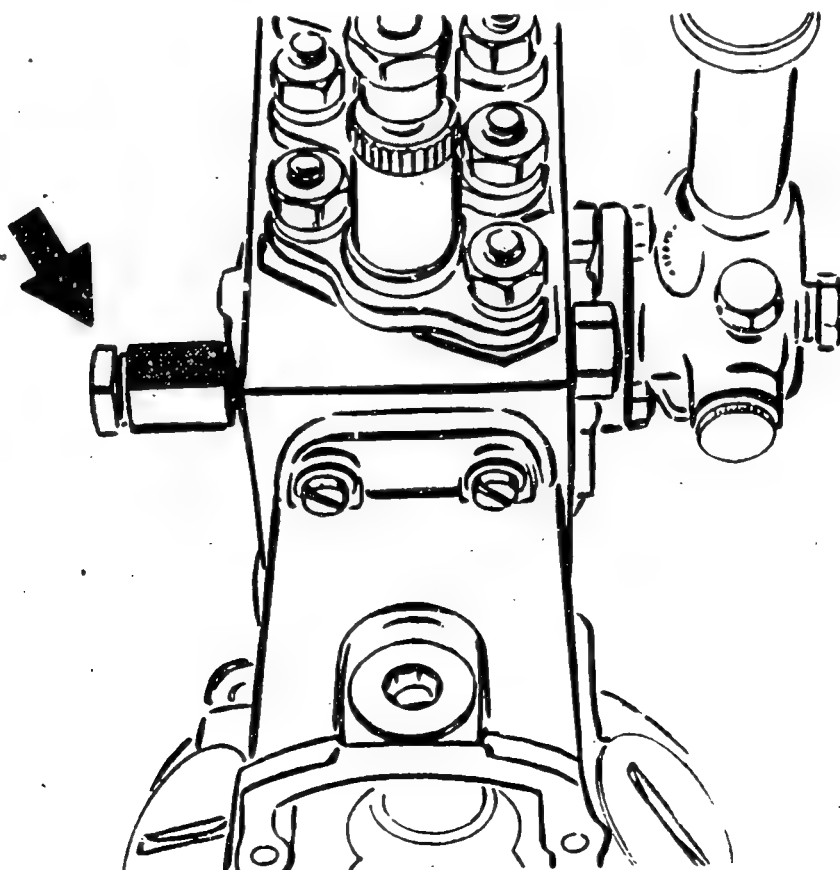
Clamp pump (in normal assembly)
position on test bench.

Remove plug 2 911 271 701 (arrow) and
connect fuel return line with overflow
valve 1 417 413 012 in its place.

Note:

Pumps fitted with a ROBO diaphragm
are to be checked with the diaphragm
in position.

Continue: B18/1 Fig.: B17/2



KMK 01610

TESTING OF GOVERNOR

Perform basic adjustment of pump and sliding-sleeve adjustment in line with the appropriate instructions.

Fit governor cover.

Continue: B19/1

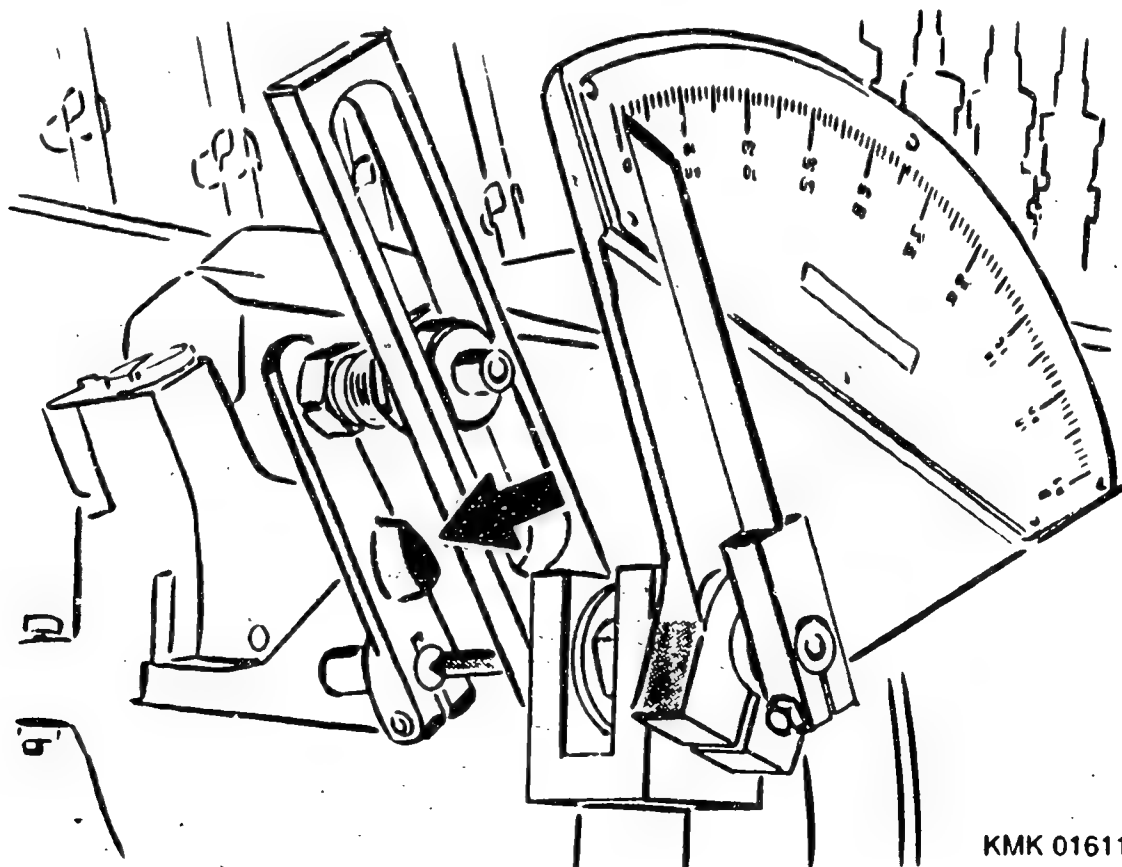
TESTING OF GOVERNOR / DTP - 1ST VERSION

For test purposes, a control lever (e.g. 1 422 003 004) is to be fitted with cam facing outwards (arrow).

Fit protractor 1 688 130 183 (picture).

Continue testing of assembly in line with appropriate instructions.

Continue: B20/1 Fig.: B19/2



KMK 01611

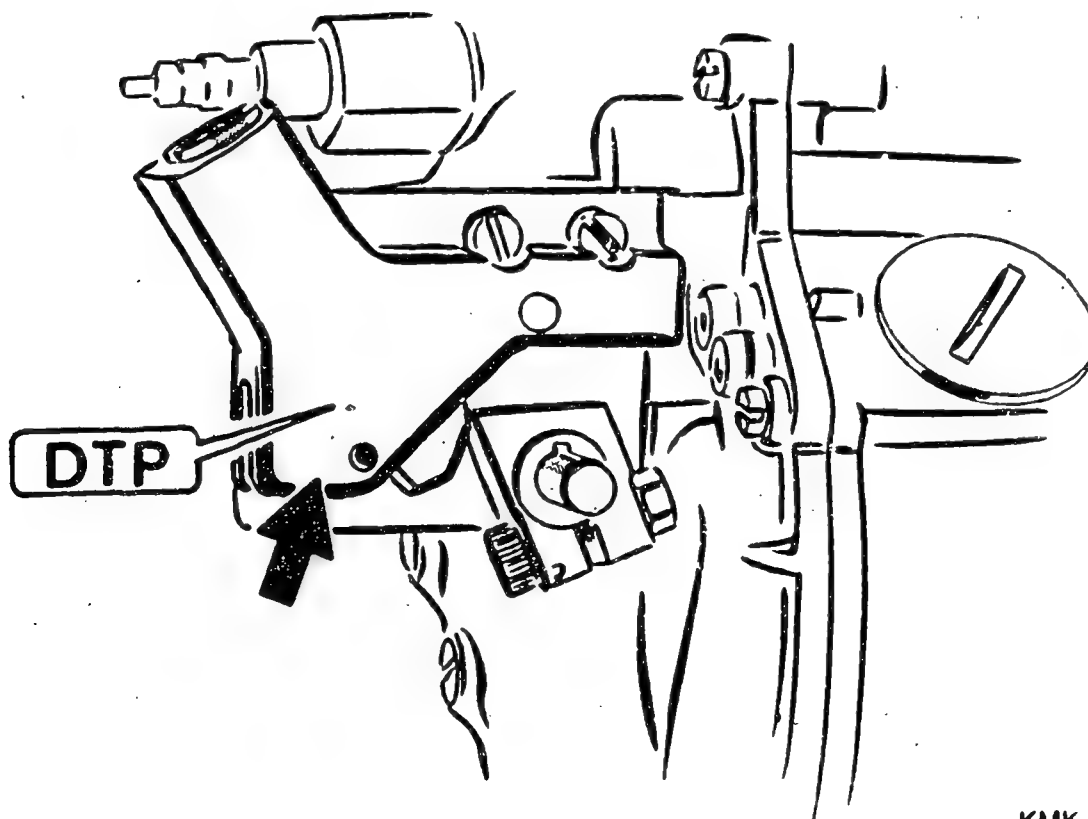
TESTING OF GOVERNOR / DTP - 1ST VERSION - ADJUSTMENT OF CUTOFF BLOCK DTP

The cutoff block DTP blocks the control lever in the cutoff position and stops inadvertent start-up of the engine.

The cutoff block DTP is likewise designed to prevent unintentional engine stop.

Remove protractor and temporarily fitted control lever again.

Continue: B21/1 Fig.: B20/2



KMK 01612

TESTING OF GOVERNOR / DTP - 1ST VERSION - IDLE ADJUSTMENT

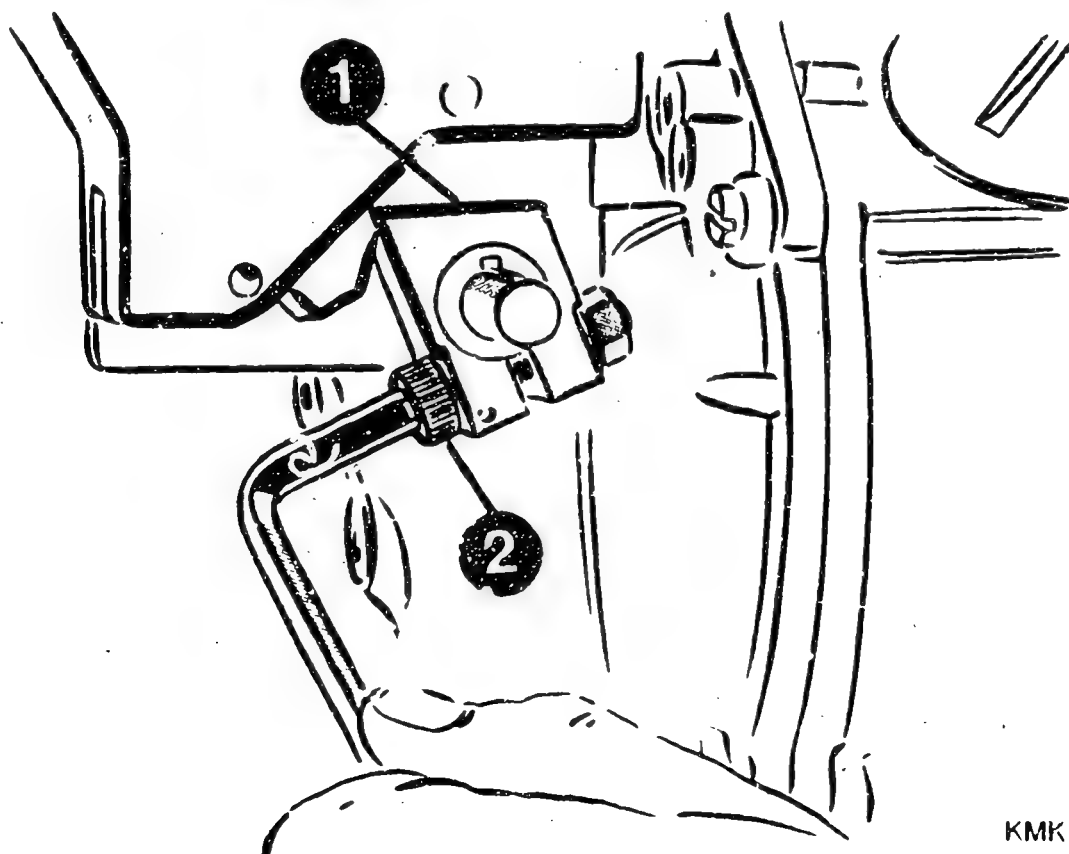
Fit stop lever (picture, 1), but do not tighten clamping screw.

Set idling speed specified in test-specification sheet. Move idle stop lever such that it makes contact with stop of cutoff block DTP. Set idle delivery by turning hexagon-socket-head cap screw (picture, 2).

Tighten clamping screw to 7...10 Nm.

Set locking/release in line with appropriate instructions.

Continue: B22/1 Fig.: B21/2



KMK 01613

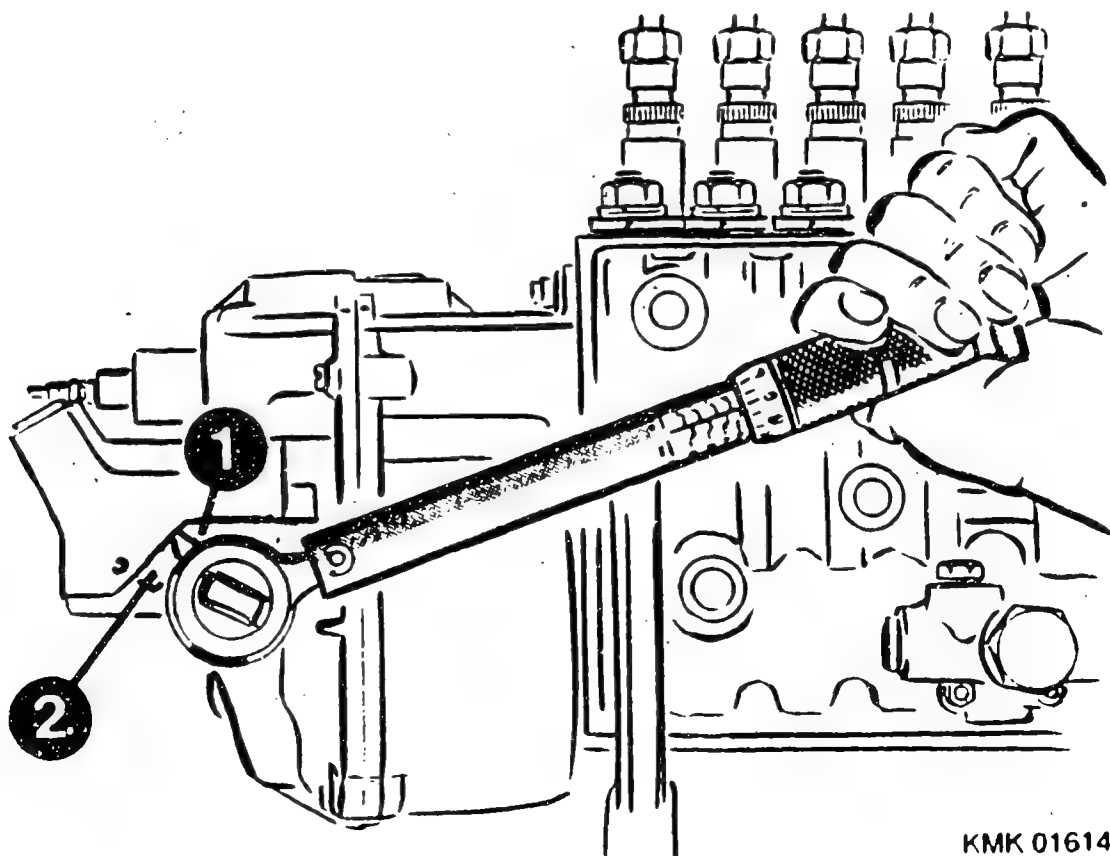
TESTING OF GOVERNOR / DTP - 1ST VERSION - ADJUSTMENT OF DTP TORQUE

The adjustment travel of the stop lever (picture, 1) is limited by the stop of the cutoff block. The governor can only reach the "STOP" position if the shaft torque is greater than the initial tension of the stop (picture, 2).

Attach adaptor 9 689 085 042 to torque wrench and position on control-lever shaft.

Measure torque required to move control-lever shaft to "STOP" position.

Continue: B23/1 Fig.: B22/2



KMK 01614

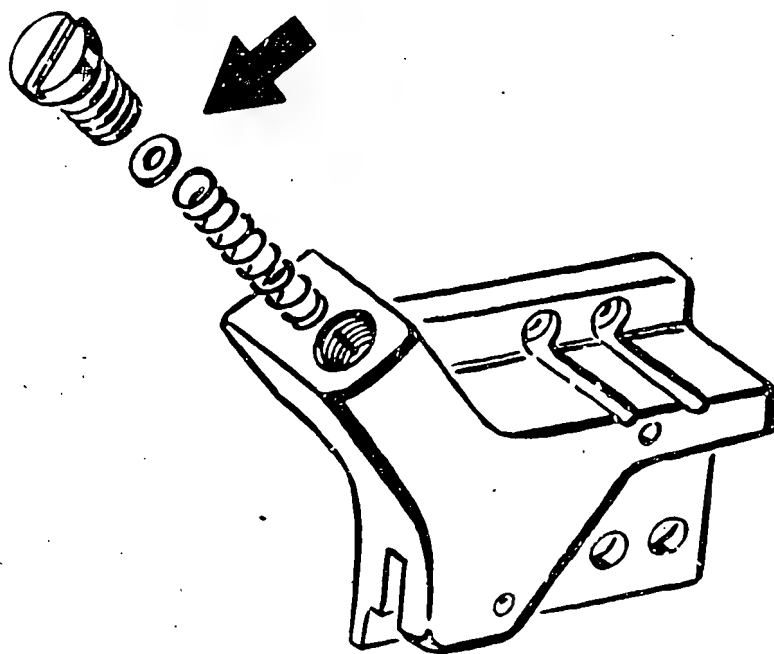
TESTING OF GOVERNOR / DTP - 1ST VERSION
- ADJUSTMENT OF DTP TORQUE

Required torque of cutoff-block
stop: 10...12 Nm

If the required torque is not within
the stated tolerance range, adjustment
must be effected by replacing the shim
(picture, arrow).

Fit original control lever after
performing adjustment.

Continue: B24/1 Fig.: B23/2



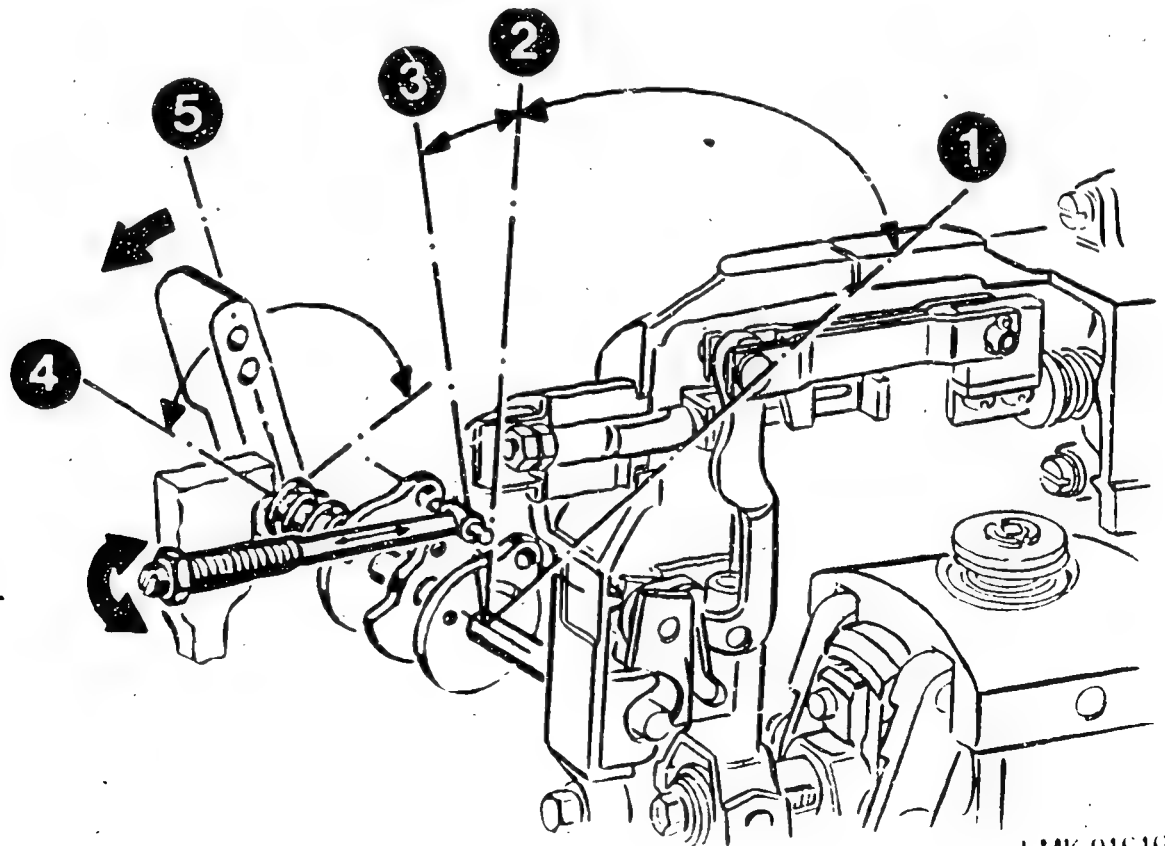
KMK 01615

TESTING OF GOVERNOR / DTP - 2ND VERSION

- 1 = Full-load position
- 2 = Idle position
- 3 = Stop position
- 4 = Adjusting screw for idle control-rod travel
- 5 = Blocking torque

The cutoff block DTP restricts the rotation of the setting shaft and prevents inadvertent attainment of the "STOP" position.

Continue: B25/1 Fig.: B24/2



KMK 01616

TESTING OF GOVERNOR / DTP - 2ND VERSION

The test steps outlined below are to be performed with particular care in conjunction with adjustment of the cutoff block DTP:

- * Adjustment of idle control-rod travel
- * Adjustment of DTP torque

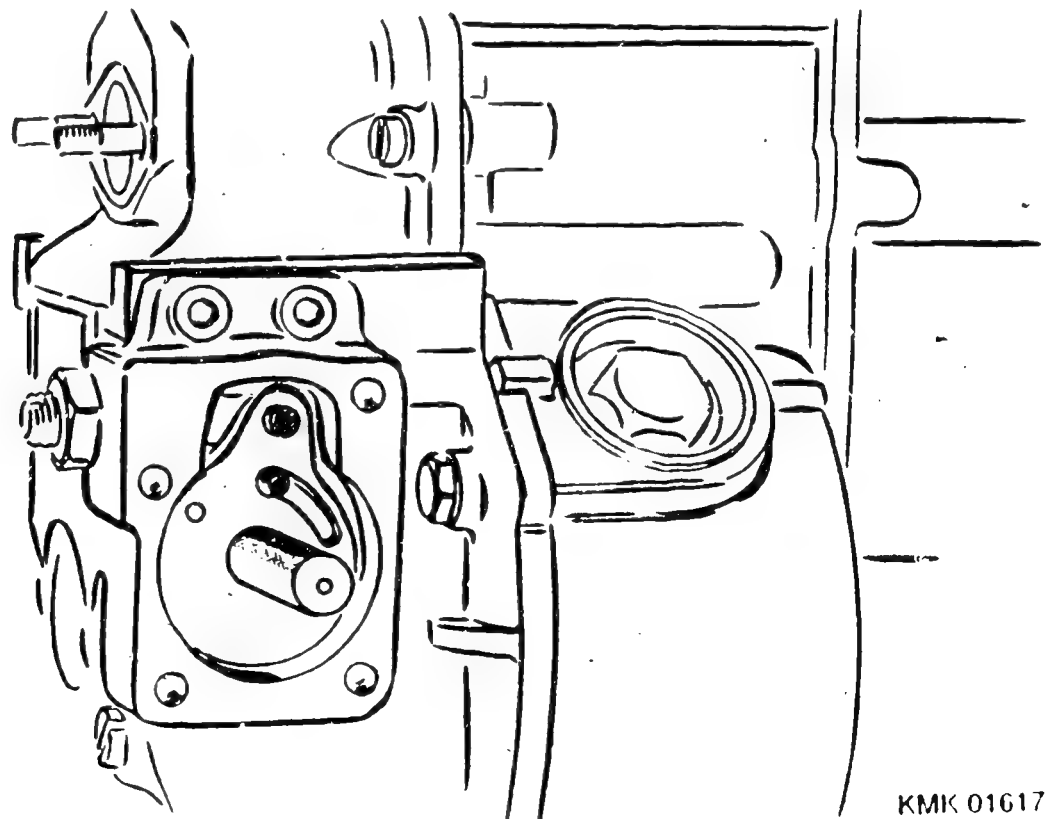
Continue: B26/1

TESTING OF GOVERNOR / DTP - 2ND VERSION

Thoroughly lubricate individual components of cutoff block DTP with special grease 5 932 240 150.

Attach closing cover to DTP housing.

Continue: B27/1 Fig.: B26/2

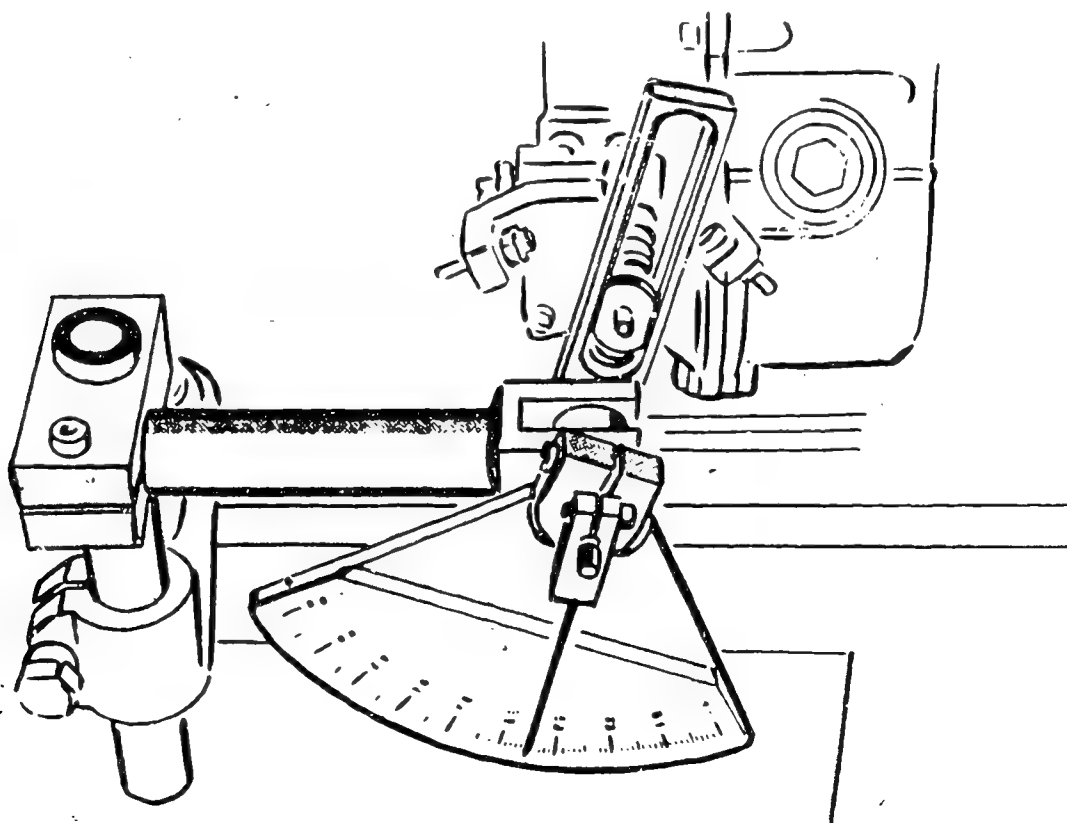


KMK 01617

TESTING OF GOVERNOR / DTP - 2ND VERSION

Fit protractor 1 688 130 183.

Continue: B28/1 Fig.: B27/2



KMK 01618

TESTING OF GOVERNOR / DTP - 2ND VERSION

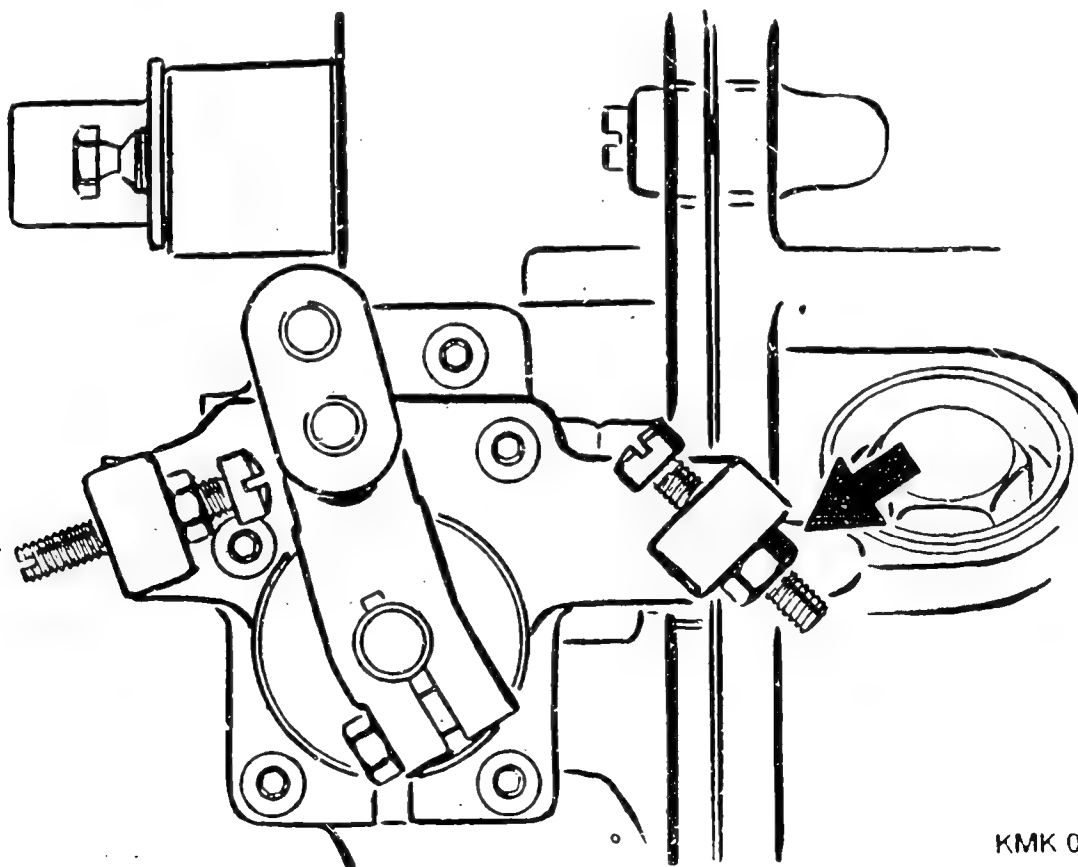
Fit speed limiting screw (arrow).

Set speed indicated in test-specification sheet under "Speed limitation".

Move control lever to full-load position.

Then adjust speed limiting screw such that there is a reduction in control-rod travel of 1.0 mm (starting from full-load control-rod travel).

Continue: C01/1 Fig.: B28/2



KMK 01619

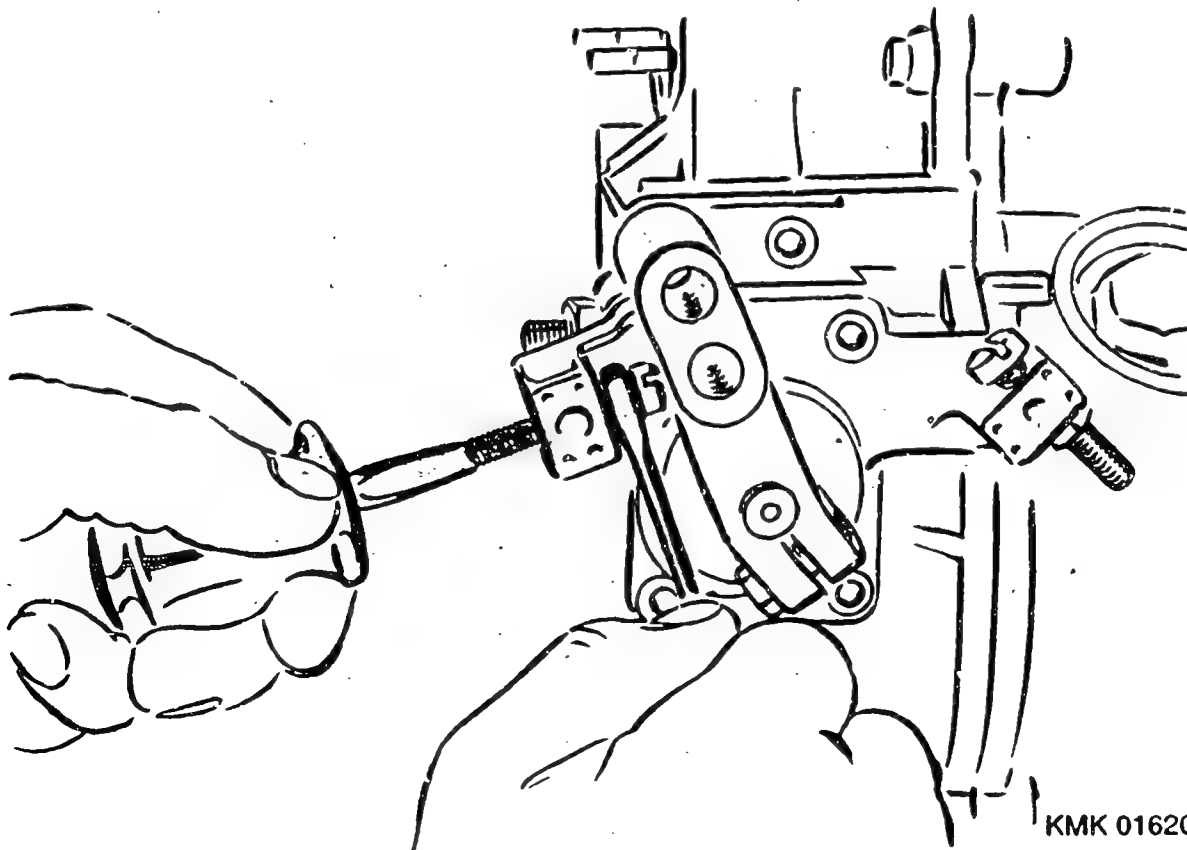
TESTING OF GOVERNOR / DTP - 2ND VERSION

Move control lever to "STOP" position.

At pump speed 0, adjust shutoff stop screw until control-rod travel is 0--5...1.0 mm.

Continue testing of assembly in line with appropriate instructions.

Continue: C02/1 Fig.: C01/2



TESTING OF GOVERNOR / DTP - 2ND VERSION - IDLE ADJUSTMENT

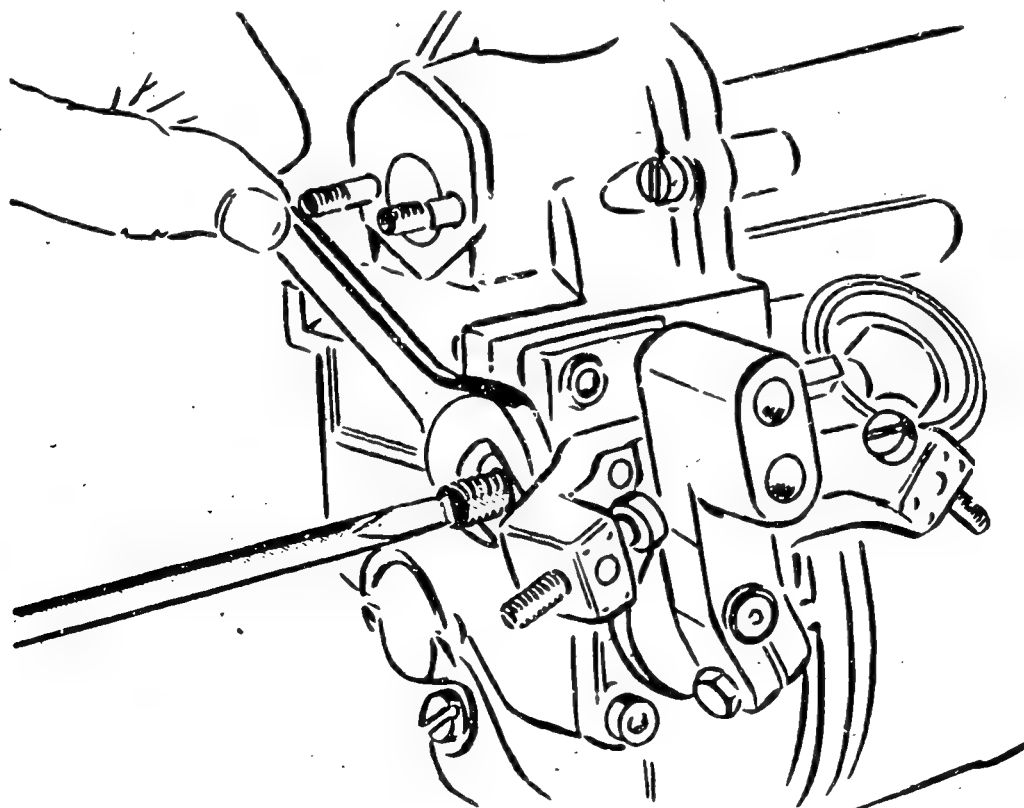
Operate pump at idling speed and position control lever against cutoff block DTP.

Set idle control-rod travel as per test-specification sheet by turning adjusting screw (picture).

Tighten lock nut of adjusting screw to 5...7 mm.

Set locking/release in accordance with appropriate instructions.

Continue: C03/1 Fig.: C02/2



KMK 01621

TESTING OF GOVERNOR / DTP - 2ND VERSION
- TESTING OF DTF TORQUE

Attach adaptor 9 689 085 042 to
control-lever shaft and measure
engagement torque for "STOP" position
with torque wrench.

Set value: 10...12 Nm.

Continue: C04/1 Fig.: C03/2



CONCLUDING WORK

Sealing:

Tighten screws and lock nuts.

Pay attention to tightening torques!

Secure stop screws with paint or wire.

Re-attach corresponding securing devices where appropriate.

Make repair mark and apply workshop mark.

Continue: C05/1

LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

- * 7 minutes at 1.5 bar, then
1 minute at 0.5 bar.

Perform visual inspection to establish whether all sealing surfaces, unions, sealing rings and end covers on housing and cover are leakproof.

There must be no visible air bubbles.

Set fuel-injection pump on pump test bench.

Continue: C05/2

LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

Note:

To avoid the possibility of skin irritation, apply protective cream to hands before starting test and wash hands in soap and water upon completion of testing. Wear rubber gloves if possible.

Continue: C06/1

INSTALLATION OF FUEL-INJECTION PUMP

Move fuel-injection pump with blocked start of delivery into installation position.

Ensure that piston of cylinder no. 1 is in TDC position.

Note:

Locking bolt 9 689 085 038 can only be removed following installation of fuel-injection pump in engine and proper installation of transmission.

Continue: N26/1

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EDITORIAL NOTE

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Continue: N28/2

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